Simulation of light scattering from compact irregular particles in a wide range of sizes

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We apply computer modeling to study light scattering properties of compact irregular particles in a wide range of size parameters from X = 10 to 150. As model shapes, we use faceted Gaussian Random Field Particles [1]. To solve the light scattering problem we apply the Discontinuous Galerkin Time Domain method [2]. It allows optimal spatial discretization based on unstructured meshing and excellent parallel scalability that is critical for large-scale simulations.

With such systematic variation of sizes we are able to track qualitative changes in the angular dependencies of intensity and linear polarization degree. The observed evolution of the scattering angle curves with increasing size parameter can be expected taking into account the decreasing role of light diffraction on edges and facets. Interestingly, all main linear polarization features are preserved in the entire size range. At X = 150 we approach the geometrical optics regime where we can apply ray trajectory analysis. This gives us insights into the light scattering mechanisms that work at smaller sizes.

References

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